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Environmental Assessment

for

Mobiles

for

FCC ID: FCC ID: FRW2000-VHF

Model:P2000-VHF

to

Federal Communications Commission

47 CFR 1.1310 (MPE)

Radiofrequency Radiation Exposure Limits

Date Of Report: September 29, 2003

On the Behalf of the Applicant:

Wulfsberg Electronics Division

At the Request of:

P.O. Part of 13187

Wulfsberg Electronics Division
6400 Wilkinson Drive
Prescott, AZ 86301-6164

Attention of:

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Supervised By:

A handwritten signature in black ink, reading 'M. Flom P. Eng.' with a stylized flourish at the end.

Morton Flom, P. Eng.

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Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

a) **Test Report (Supplemental)**

b) Laboratory: M. Flom Associates, Inc.
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044) Chandler, AZ 85225

c) Report Number: d0390089

d) Client: Wulfsberg Electronics Division
6400 Wilkinson Drive
Prescott, AZ 86301-6164

e) Identification: P2000-VHF
FCC ID: FRW2000-VHF
Description: VHF 136-174MHz Transceiver

f) EUT Condition: Not required unless specified in individual tests.

g) Report Date: September 29, 2003
EUT Received: August 11, 2003

h, j, k): As indicated in individual tests.

i) Sampling method: No sampling procedure used.

l) Uncertainty: In accordance with MFA internal quality manual.

m) Supervised by:



Morton Flom, P. Eng.

n) Results: The results presented in this report relate only to the item tested.

o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

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Identification of the Equipment Under Test (EUT)**Name and Address of Applicant:**

Wulfsberg Electronics Division
6400 Wilkinson Drive
Prescott, AZ 86301-6164

Manufacturer:

Applicant

FCC ID:

FRW2000-VHF

Model Number:

P2000-VHF

Description:

VHF 136-174MHz Transceiver

Type of Emission:16K0F3E, 11K0F3E, 8K10F1E,
8K10F1D, 20K0F1E**Frequency Range, MHz:**

136.000 to 174.000

Power Rating, Watts:☒ Switchable☐ Variable

1 to 10

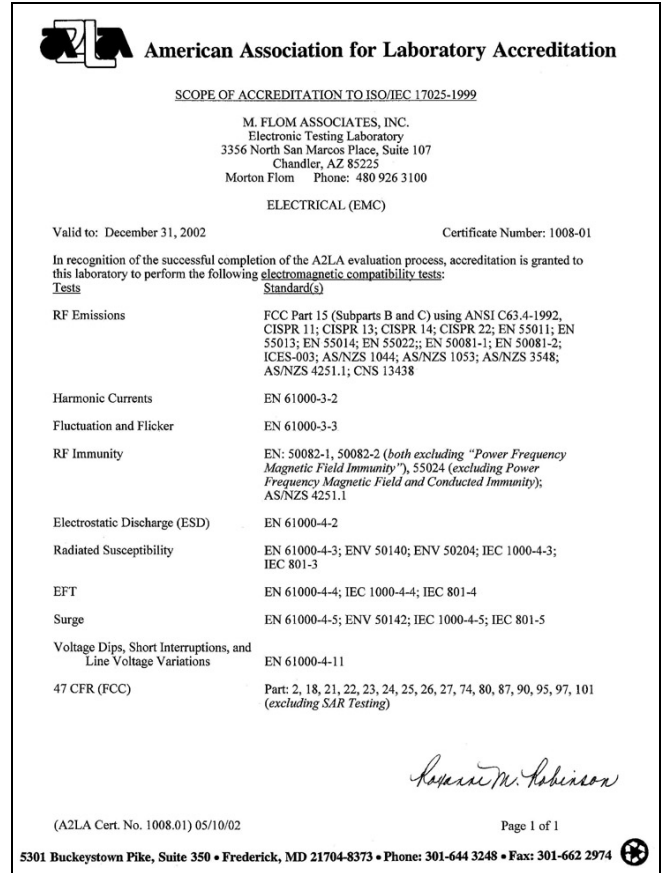
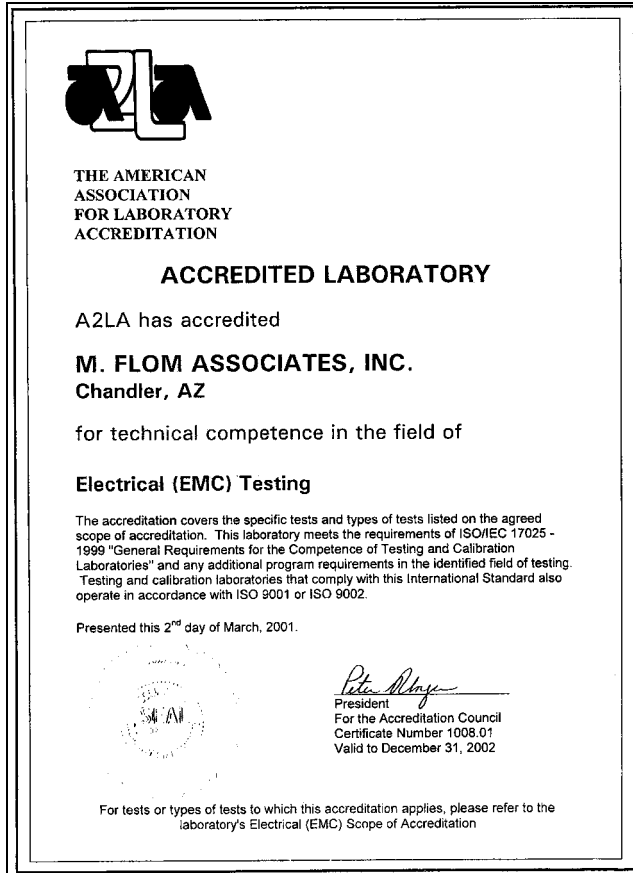
☐ N/A**Modulation:**☐ AMPS
☐ TDMA
☐ CDMA
☒ OTHER**Antenna:**☐ Helical
☐ Monopole
☐ Whip
☒ Other

Note: For RF Safety test antenna gain taken at the upper range of expected gain (i.e. 0 dBd) and RF Power set to highest nominal power across all channels.

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M. Flom Associates, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA) as shown in the scope below.



"This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this report have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report."

Should this report contain any data for tests for which we are not accredited, or which have been undertaken by a subcontractor that is not A2LA accredited, such data would not covered by this laboratory's A2LA accreditation.

**Standard Test Conditions
and
Engineering Practices**

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-1992/2000, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst-case measurements.

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Name of Test: Environmental Assessment

Specification: FCC: 47 CFR 1.1310

Measurement Guide: ANSI/IEEE C95.1 1992

Test Equipment: Maximum Permissible Exposure (MPE) measurement system, consisting of:
Narda 8717-1174R, Radiation meter
Narda 8761D, E-field probe (300 kHz – 3 GHz)
(Calibrated Nov-98)

Measurement Procedure:

1. The following measurements were performed with a Narda probe using ANSI/IEEE C95.1 as a guide.
2. Prior to making any measurements, the measurements system was calibrated in accordance with the manufacturer's procedures.
3. The EUT's radiating element (antenna) was placed on a 1 m tall table for ease of testing. For equipment normally operated on a metal surface, a ground plane was used.
4. The remaining equipment necessary to operate the EUT was maintained at a distance from the measurement arrangement suitable to minimize interference with the measurements.
5. The minimum safe distance was calculated from the formula $\text{Power Density} = \text{EIRP} / 4\pi R^2$ (Peak Watts/m²). The calculation is shown with the measurement data.
6. With the EUT operating at maximum power, a search was initiated for worst case emissions with the probe raised and lowered over a range of 0.2 to 2 meters in height and over a horizontal plane of 0° to 360°.
7. Average values were calculated for the whole body (0.2-2.0m), lower body (0.2-0.8m) and upper body (1.0-2.0m).

Results: Attached.

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Name of Test: R.F. Radiation Exposure

FCC Rules: 1.1307, 1.1310, 1.1311, 2.1091
Description, EUT: See page 2 of Test Report

Frequencies tested, MHz VHF Only 136.025 155.025 173.975
Antenna Gain = 0 dB
Antenna Model AT-695 (Manufactured by Comant)

Instruments Narda 8717-1174R, Radiation Meter
Narda 8760B, E-field probe (300 kHz – 1 GHz)
Narda 8761D, E-field probe (300 kHz – 3 GHz)

Limits: Uncontrolled Exposure	0.3-1.234 MHz:	Limit [mW/cm ²] = 100
47 CFR 1.1310	1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
Table 1, (B)	30-300 MHz:	Limit [mW/cm ²] = 0.2
	300-1500 MHz	Limit [mW/cm ²] = f/1500
	1500-100,000 MHz:	Limit [mW/cm ²] = 1.0

Power, Conducted, W = 10 W
Power + Ant. Gain, W = 5 W, 50% Duty Cycle
Limit: Uncontrolled Exposure = 0.200 mW/cm²

Results at tested distance	Power Density, mW/cm ²			
	Probe Height, m	Freq. 136 MHz Distance 21 cm	Freq. 155 MHz Distance 21 cm	Freq. 174 MHz Distance 21 cm
	2.0	0.008	0.025	0.016
	1.8	0.011	0.028	0.018
	1.6	0.016	0.033	0.023
	1.4	0.018	0.035	0.027
	1.2	0.015	0.032	0.018
	1.0	0.008	0.019	0.012
	0.8	0.019	0.024	0.012
	0.6	0.025	0.045	0.025
	0.4	0.017	0.040	0.028
	0.2	0.011	0.037	0.039

Power Density Calculations: The measured power density readings were summed and the results divided by the number of readings to calculate the average.

	136 MHz	155 MHz	174 MHz
Whole body average (0.2 – 2.0 m, mW/cm ²) =	0.0148	0.0318	0.0218
Lower body average (0.2 – 0.8 m, mW/cm ²) =	0.018	0.0365	0.026
Upper body average (1.0 – 2.0 m, mW/cm ²) =	0.01267	0.0287	0.019



Performed By:

David Lee

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Test Setup: Maximum Permissible Exposure (MPE)

State: VHF



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Name of Test: R.F. Radiation Exposure

FCC Rules: 1.1307, 1.1310, 1.1311, 2.1091
Description, EUT: See page 2 of Test Report

Equipment under test: P2000-VHF with P2000-UHF1
Frequencies tested, MHz: 155.025 437.025
Antenna Gain: = 0 dB + 3 dB nominal
Antenna Models: AT-695 and AT-462 (Manufactured by Comant)

Instruments: Narda 8717-1174R, Radiation Meter
Narda 8760B, E-field probe (300 kHz – 1 GHz)
Narda 8761D, E-field probe (300 kHz – 3 GHz)

Limits: Uncontrolled Exposure	0.3-1.234 MHz:	Limit [mW/cm ²] = 100
47 CFR 1.1310	1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
Table 1, (B)	30-300 MHz:	Limit [mW/cm ²] = 0.2
	300-1500 MHz:	Limit [mW/cm ²] = f/1500
	1500-100,000 MHz:	Limit [mW/cm ²] = 1.0

Power, Conducted, W = 10 W + 10 W
Power + Ant. Gain, W = 5 W + 10 W, 50% Duty Cycle
Limit: Uncontrolled Exposure = 0.200 and 0.291 mW/cm²

Results at tested distance	Power Density, mW/cm ²			
	Probe Height, m	Freq. 155 MHz Distance 80 cm	Freq. 437 MHz Distance 80 cm	Both Frequencies Distance 80 cm
	2.0	0.130	0.124	0.194
	1.8	0.115	0.211	0.269
	1.6	0.093	0.174	0.213
	1.4	0.070	0.145	0.169
	1.2	0.062	0.221	0.235
	1.0	0.086	0.203	0.236
	0.8	0.107	0.129	0.186
	0.6	0.117	0.112	0.180
	0.4	0.118	0.117	0.180
	0.2	0.115	0.047	0.133

Power Density Calculations: The measured power density readings were summed and the results divided by the number of readings to calculate the average.

	155 MHz	437 MHz	Both
Whole body average (0.2 – 2.0 m, mW/cm ²) =	0.1013	0.1483	0.1994
Lower body average (0.2 – 0.8 m, mW/cm ²) =	0.11425	0.10125	0.16975
Upper body average (1.0 – 2.0 m, mW/cm ²) =	0.092667	0.179667	0.2191667



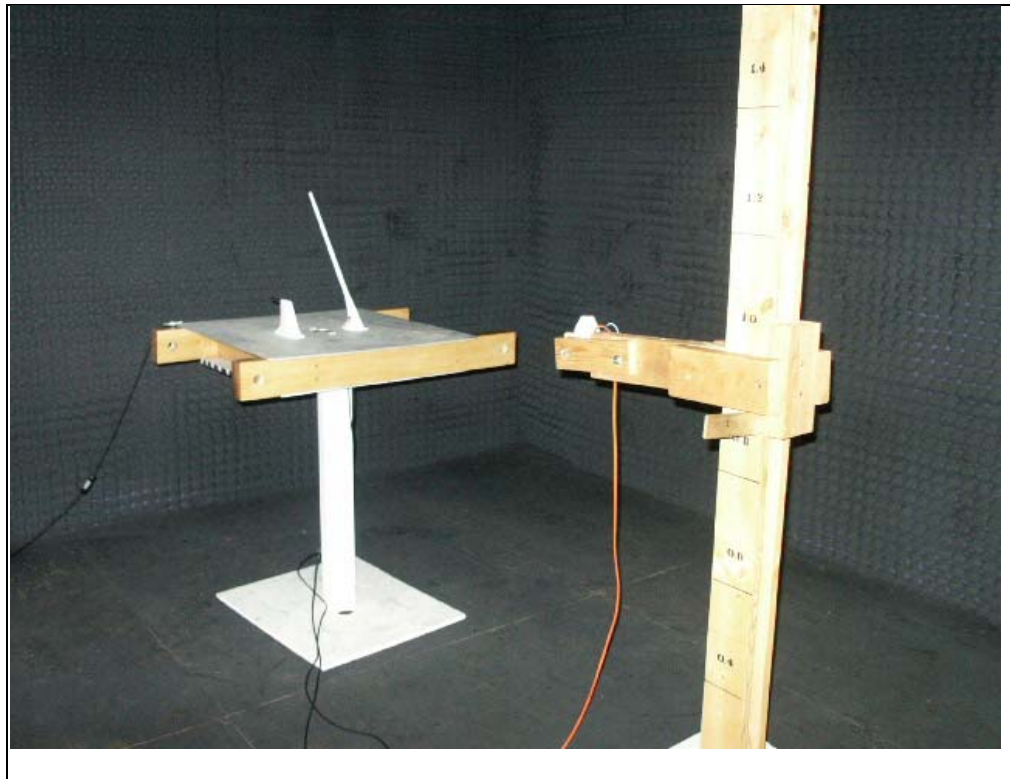
Performed By:

David Lee

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Test Setup: Maximum Permissible Exposure (MPE)

State: VHF + UHF1



Page Number 10 of 13.

Name of Test: R.F. Radiation Exposure

FCC Rules: 1.1307, 1.1310, 1.1311, 2.1091

Description, EUT: See page 2 of Test Report

Equipment under test: P2000-VHF with P2000-UHF2
 Frequencies tested, MHz 155.025 485.025
 Antenna Gain = 0 dB + 3 dB nominal
 Antenna Model AT-695 and AT-462 (Manufactured by Comant)

Instruments Narda 8717-1174R, Radiation Meter
 Narda 8760B, E-field probe (300 kHz – 1 GHz)
 Narda 8761D, E-field probe (300 kHz – 3 GHz)

Limits: Uncontrolled	0.3-1.234 MHz:	Limit [mW/cm ²] = 100
Exposure	1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
47 CFR 1.1310	30-300 MHz:	Limit [mW/cm ²] = 0.2
Table 1, (B)	300-1500 MHz	Limit [mW/cm ²] = f/1500
	1500-100,000 MHz:	Limit [mW/cm ²] = 1.0

Power, Conducted, W = 10 W + 10 W
 Power + Ant. Gain, W = 5 W + 10 W, 50% Duty Cycle
 Limit: Uncontrolled Exposure = 0.200 and 0.323 mW/cm²

Results at tested distance	Power Density, mW/cm ²			
	Probe Height, m	Freq. 155 MHz Distance 100 cm	Freq. 485 MHz Distance 100 cm	Both Frequencies Distance 100 cm
	2.0	0.126	0.182	0.241
	1.8	0.116	0.243	0.301
	1.6	0.094	0.236	0.272
	1.4	0.070	0.223	0.242
	1.2	0.070	0.283	0.299
	1.0	0.084	0.204	0.239
	0.8	0.094	0.181	0.223
	0.6	0.102	0.173	0.220
	0.4	0.105	0.186	0.235
	0.2	0.105	0.108	0.153

Power Density Calculations: The measured power density readings were summed and the results divided by the number of readings to calculate the average.

	155 MHz	485 MHz	Both
Whole body average (0.2 – 2.0 m, mW/cm ²) =	0.0966	0.2019	0.2425
Lower body average (0.2 – 0.8 m, mW/cm ²) =	0.1015	0.162	0.20775
Upper body average (1.0 – 2.0 m, mW/cm ²) =	0.0933	0.2285	0.265667



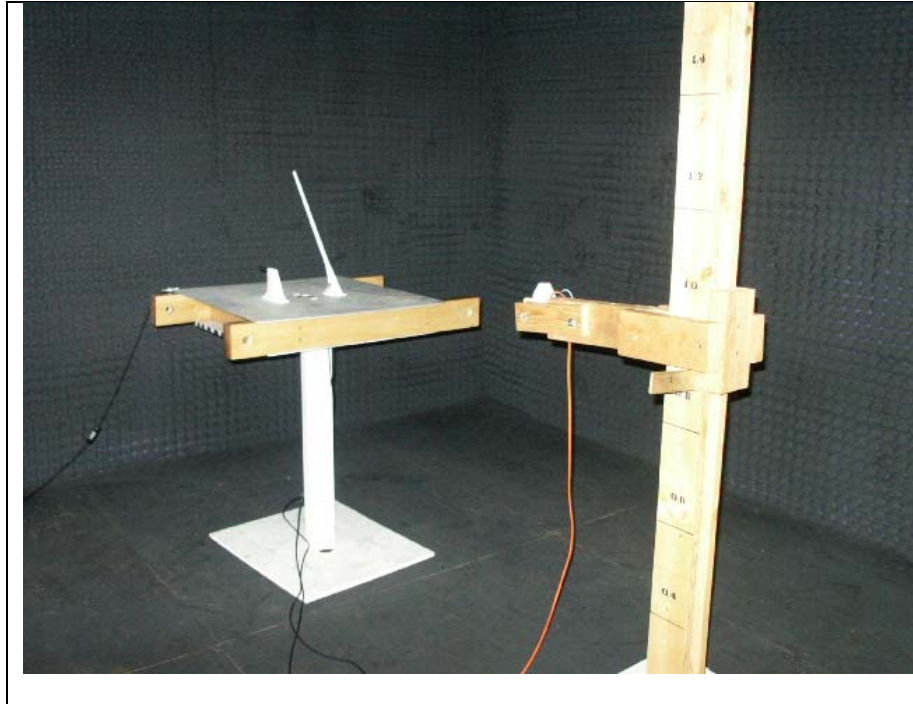
Performed By:

David Lee

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Test Setup: Maximum Permissible Exposure (MPE)

State: VHF + UHF2



Page Number 12 of 13.

Name of Test: R.F. Radiation Exposure

FCC Rules: 1.1307, 1.1310, 1.1311, 2.1091
Description, EUT: See page 2 of Test Report

Equipment under test: P2000-VHF with P2000-800
Frequencies tested, MHz 155.025 837.025
Antenna Gain = 0 dB + 3 dB nominal
Antenna Model AT-695 and CI 310 (Manufactured by Comant)

Instruments Narda 8717-1174R, Radiation Meter
Narda 8760B, E-field probe (300 kHz – 1 GHz)
Narda 8761D, E-field probe (300 kHz – 3 GHz)

Limits: Uncontrolled Exposure	0.3-1.234 MHz:	Limit [mW/cm ²] = 100
47 CFR 1.1310	1.34-30 MHz:	Limit [mW/cm ²] = (180/f ²)
Table 1, (B)	30-300 MHz:	Limit [mW/cm ²] = 0.2
	300-1500 MHz	Limit [mW/cm ²] = f/1500
	1500-100,000 MHz:	Limit [mW/cm ²] = 1.0

Power, Conducted, W = 5 W + 5 W
Power + Ant. Gain, W = 5 W + 5 W, 50% Duty Cycle
Limit: Uncontrolled Exposure = 0.200 and 0.558 mW/cm²

Results at tested distance	Power Density, mW/cm ²			
	Probe Height, m	Freq. 155 MHz Distance 100 cm	Freq. 837 MHz Distance 100 cm	Both Frequencies Distance 100 cm
	2.0	0.113	0.087	0.155
	1.8	0.100	0.196	0.245
	1.6	0.083	0.178	0.212
	1.4	0.072	0.131	0.158
	1.2	0.079	0.077	0.116
	1.0	0.091	0.071	0.120
	0.8	0.104	0.038	0.112
	0.6	0.108	0.040	0.117
	0.4	0.108	0.073	0.138
	0.2	0.108	0.129	0.189

Power Density Calculations: The measured power density readings were summed and the results divided by the number of readings to calculate the average.

	155 MHz	837 MHz	Both
Whole body average (0.2 – 2.0 m, mW/cm ²) =	0.0966	0.102	0.1562
Lower body average (0.2 – 0.8 m, mW/cm ²) =	0.107	0.07	0.139
Upper body average (1.0 – 2.0 m, mW/cm ²) =	0.089667	0.1233	0.167667



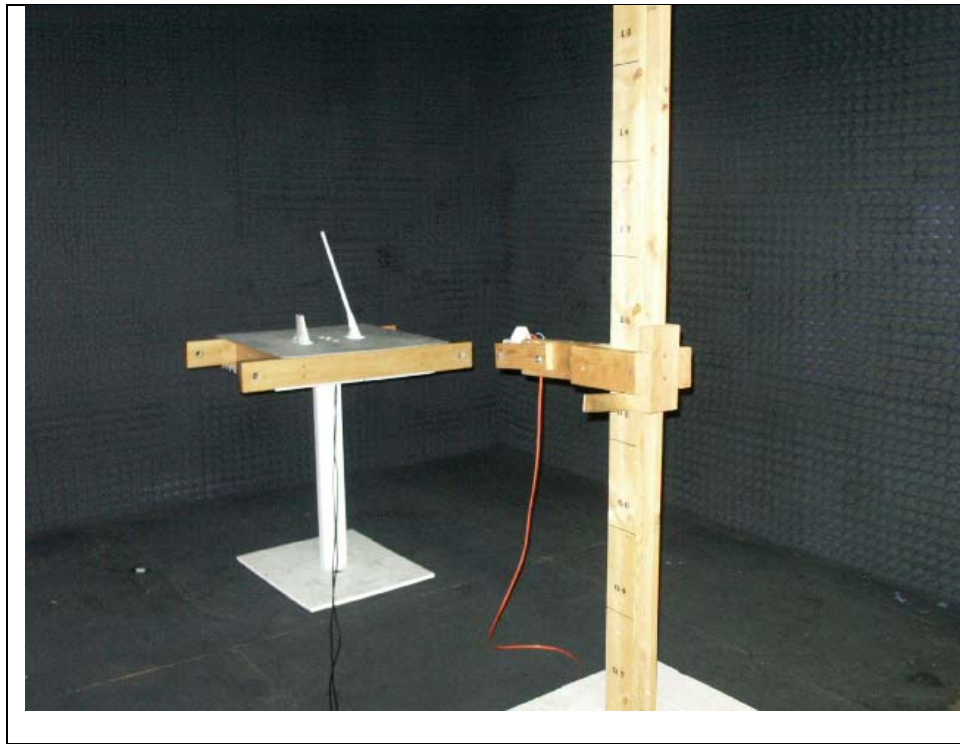
Performed By:

David Lee

Page Number 13 of 13.

Test Setup: Maximum Permissible Exposure (MPE)

State: VHF + 800



A handwritten signature in black ink, appearing to read 'David Lee'.

Performed By:

David Lee

(The following will be placed in the Instruction Manual)

Mandatory Safety Instructions to Installers & Users

Use only manufacturer or dealer supplied antenna.

Antenna Minimum Safe Distance: ≥ 100 cm.

Antenna Gain: zero dBd referenced to a dipole.

The Federal Communications Commission has adopted a safety standard for human exposure to RF (Radio Frequency) energy which is below the OSHA (Occupational Safety and Health Act) limits.

Antenna Mounting: The antenna supplied by the manufacturer or radio dealer must not be mounted at a location such that during radio transmission, any person or persons can come closer than the above indicated minimum safe distance to the antenna i.e. ≥ 100 cm.

To comply with current FCC RF Exposure limits, the antenna must be installed at or exceeding the minimum safe distance shown above, and in accordance with the requirements of the antenna manufacturer or supplier.

Base Station Installation: The antenna should be fixed-mounted on an outdoor permanent structure. RF Exposure compliance must be addressed at the time of installation.

Antenna Substitution: Do not substitute any antenna for the one supplied or recommended by the manufacturer or radio dealer. You may be exposing person or persons to excess radio frequency radiation. You may contact your radio dealer or the manufacturer for further instructions.

Warning: Maintain a separation distance from the antenna to a person(s) of ≥ 100 cm.

You, as the qualified end-user of this radio device must control the exposure conditions of bystanders to ensure the minimum separation distance (above) is maintained between the antenna and nearby persons for satisfying RF Exposure compliance. The operation of this transmitter must satisfy the requirements of Occupational/Controlled Exposure Environment, for work-related use. Transmit only when person(s) are at least the minimum distance from the properly installed, externally mounted antenna.

**Testimonial
and
Statement of Certification**

This is to certify that:

1. **That** the application was prepared either by, or under the direct supervision of, the undersigned.
2. **That** the technical data supplied with the application was taken under my direction and supervision.
3. **That** the data was obtained on representative units, randomly selected.
4. **That**, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

Certifying Engineer:

A handwritten signature in black ink, appearing to read "M. Flom P. Eng.", with a horizontal line drawn underneath the signature.

Morton Flom, P. Eng.